

## CLAIMS

What is claimed is:

- 1           1. A heterojunction bipolar transistor (HBT), comprising:  
2           a collector;  
3           an emitter; and  
4           a base located between the collector and the emitter, the base including a layer  
5           of gallium arsenide antimonide (GaAsSb) less than 49 nanometers (nm) thick.
  
- 1           2. The HBT of claim 1, wherein the gallium arsenide antimonide of the base  
2           has an arsenic (As) fraction in a range from about 50% to about 51%.
  
- 1           3. The HBT of claim 1, wherein the gallium arsenide antimonide of the base  
2           has an arsenic (As) fraction in a range from about 50% to about 65%.
  
- 1           4. The HBT of claim 1, wherein the gallium arsenide antimonide of the base  
2           has an arsenic (As) fraction in a range from about 50% to about 60%.
  
- 1           5. The HBT of claim 1, wherein the gallium arsenide antimonide of the base  
2           has an arsenic (As) fraction in a range from about 54% to about 56%.
  
- 1           6. The HBT of claim 1, wherein the gallium arsenide antimonide of the base  
2           has an arsenic (As) fraction of approximately 55%.

1           7. The HBT of claim 1, wherein the base layer of GaAsSb is less than 20 nm  
2   thick.

1           8. The HBT of claim 1, wherein the base layer of GaAsSb is strained so that its  
2   lattice constant conforms to the lattice constant of the collector and the emitter.

1           9. The HBT of claim 1, wherein the base layer of GaAsSb is doped with  
2   beryllium (Be) at a doping concentration of between approximately  $6 \times 10^{19}$  and  $4 \times 10^{20}$   
3   acceptors/cm<sup>3</sup>.

1           10. The HBT of claim 1, wherein the base layer of GaAsSb is doped with  
2   carbon (C) at a doping concentration of between approximately  $6 \times 10^{19}$  and  $4 \times 10^{20}$   
3   acceptors/cm<sup>3</sup>.

1           11. The HBT of claim 7, wherein the base layer of GaAsSb is doped with  
2   carbon (C) at a doping concentration of between approximately  $6 \times 10^{19}$  and  $4 \times 10^{20}$   
3   acceptors/cm<sup>3</sup>.

1           12. A method for making a heterojunction bipolar transistor (HBT), the  
2   method comprising:  
3       forming a collector;  
4       forming an emitter; and  
5       forming a base located between the collector and the emitter, the base  
6   including a layer of gallium arsenide antimonide (GaAsSb) less than 49 nanometers  
7   (nm) thick.

1           13. The method of claim 12, wherein the base is formed of gallium arsenide  
2   antimonide having an arsenic (As) fraction in a range from about 50% to about 51%.

1           14. The method of claim 12, wherein the base is formed of gallium arsenide  
2   antimonide having an arsenic (As) fraction in a range from about 50% to about 65%.

1           15. The method of claim 12, wherein the base is formed gallium arsenide  
2   antimonide having an arsenic (As) fraction in a range from about 50% to about 60%.

1           16. The method of claim 12, wherein the base is formed of gallium arsenide  
2   antimonide having an arsenic (As) fraction in a range from about 54% to about 56%.

1           17. The method of claim 12, wherein the base is formed of gallium arsenide  
2   antimonide having an arsenic (As) fraction of approximately 55%.

1           18. The method of claim 12, wherein the base layer of GaAsSb is less than  
2   20 nm thick.

1           19. The method of claim 12, further comprising the step of straining the base  
2   layer of GaAsSb so that its lattice constant conforms to the lattice constant of the  
3   collector and the emitter.

1           20. The method of claim 12, further comprising the step of doping the base  
2 layer of GaAsSb with beryllium (Be) at a doping concentration of between  
3 approximately  $6 \times 10^{19}$  and  $4 \times 10^{20}$  acceptors/cm<sup>3</sup>.

1           21. The method of claim 12, further comprising the step of doping the base  
2 layer of GaAsSb with carbon (C) at a doping concentration of between approximately  
3  $6 \times 10^{19}$  and  $4 \times 10^{20}$  acceptors/cm<sup>3</sup>.

1           22. A heterojunction bipolar transistor (HBT), comprising:  
2 a collector including indium phosphide (InP);  
3 an emitter including InP; and  
4 a base including a layer of gallium arsenide antimonide (GaAsSb) located  
5 between the collector and the emitter, the base layer being less than 49 nanometers  
6 (nm) thick and having an arsenic fraction of approximately 55% and a doping  
7 concentration of between approximately  $6 \times 10^{19}$  and  $4 \times 10^{20}$  acceptors/cm<sup>3</sup>.

1           23. The HBT of claim 22, wherein the base layer of GaAsSb is less than 20 nm  
2 thick.

1           24. The HBT of claim 22, wherein the base layer of GaAsSb is strained so that  
2 its lattice constant conforms to the lattice constant of the collector and the emitter.

1           25. The HBT of claim 22, where the HBT is configured as an npn transistor.